

collecting and preserving specimens of the various sections of the Animal Kingdom. The instructions given are most sensible, and we think Mr. Davies has exercised a sound judgment in excluding all descriptions of the mode of stuffing the Mammalia and Birds, as this, which usually occupies a considerable space in similar manuals, can scarcely be taught by any written instructions. We think, however, that he should have found some means of indicating this upon his title-page,—the setting-up of such specimens is undoubtedly one branch of “preparing” animals; and the country naturalist who might buy this book in the hope of getting information upon the subject, would feel justly aggrieved at finding no instructions in stuffing in its pages.

In recommending the ‘Practical Naturalist’s Guide’ to our readers, we must not omit to notice one section of it, which, although occupying only three or four pages, will render it a handy book even to the experienced naturalist. We allude to the “Recipes” for arsenical soaps, preservative fluids, &c.,—details which are very liable to slip out of the memory, whilst manuscript memoranda are frequently mislaid.

PROCEEDINGS OF LEARNED SOCIETIES.

ROYAL INSTITUTION OF GREAT BRITAIN.

May 21, 1858.—The Duke of Northumberland, K.G., F.R.S.,
President, in the Chair.

“On the Phænomena of Gemmation.” By Thomas H. Huxley, F.R.S., Fullerian Professor of Physiology, Royal Institution, and Professor of Natural History, Government School of Mines, Jermyn Street.

The speaker commenced by stating that a learned French naturalist, M. Duvau, proposed, many years ago, to term the middle of the eighteenth century “l’époque des Pucerons,” and that the importance of the phænomena which were at first brought to light by the study of these remarkable insects renders the phrase “epoch of Plant-lice,” as applied to this period, far less whimsically inappropriate than it might at first sight seem to be.

After a brief sketch of the mode of life of these Plant-lice, or *Aphides*, as they are technically termed,—of the structure of their singular piercing and sucking mouths, and of their relation to what are called “blights,” the circumstances which have more particularly drawn the attention of naturalists to these insects were fully detailed.

It was between the years 1740 and 1750, in fact, that Bonnet, acting upon the suggestions of the illustrious Réaumur, isolated an *Aphis* immediately after its birth, and proved to demonstration, that not only was it capable of spontaneously bringing forth numerous

living young, but that these and their descendants, to the ninth generation, preserved a similar faculty.

Observations so remarkable were not likely to pass unheeded ; but notwithstanding the careful sifting which they have received, Bonnet's results have never been questioned. On the contrary, not only have Lyonnet, Degeer, Kyber, Duvau, and others, borne ample testimony to their accuracy, but it has been shown that, under favourable conditions of temperature and food, there is practically no limit to this power of asexual multiplication, or, as it has been conveniently termed, "agamogenesis."

Thus Kyber bred the viviparous *Aphis Dianthi* and *Aphis Rosa* for three years in uninterrupted succession ; and the males and true oviparous females of the *A. Dianthi* have never yet been met with. The current notion that there is a fixed number of broods, "nine or eleven," is based on a mistake.

As, under moderately favourable conditions, an *Aphis* comes to maturity in about a fortnight, and as each *Aphis* is known to be capable of producing a hundred young, the number of the progeny which may eventually result even from a single *Aphis* during the six or seven warm months of the year is easily calculated. M. Tougaard's estimate, adopted (and acknowledged) by Morren, and copied from him by others, gives the number of the tenth brood as one quintillion. Supposing the weight of each *Aphis* to be no more than $\frac{1}{1000}$ th of a grain, the mass of living matter in this brood would exceed that in the most thickly populated countries in the world.

The agamogenetic broods are either winged or wingless. The winged forms at times rise into the air, and are carried away by the wind in clouds ; and these migrating hordes have been supposed to be males and females, swarming like the ants and bees ! During the summer months it is unusual to meet other than viviparous *Aphides*, whether winged or wingless ; but ordinarily, on the approach of cold weather, or even during warm weather, if the supplies of food fall short, the viviparous *Aphides* produce forms which are no longer viviparous, but are males and oviparous females. The former are sometimes winged, sometimes wingless. The latter, with a single doubtful exception, are always wingless.

The oviparous females lay their eggs, and then, like the males, die. It commonly happens also that the viviparous *Aphides* die, and then the eggs are left as the sole representatives of the species ; but, in mild winters, many of the viviparous *Aphides* merely fall into a state of stupor, and hibernate, to re-awake with the returning warmth of spring. At the same time, the eggs are hatched, and give rise to viviparous *Aphides*, which run through the same course as before. The species *Aphis*, therefore, is fully manifested, not in any one being or animated form, but by a cycle of such, consisting of—1st, the egg ; 2nd, an indefinite succession of viviparous *Aphides* ; 3rd, males and females eventually produced by these, and giving rise to the egg again.

If, armed with the microscope and scalpel, we examine into the minute nature of these processes (without which inquiry all specu-

lation upon their nature is vain), we find that the viviparous *Aphis* contains an organ similar to the ovarium of the oviparous female in some respects, but differing from it, as Von Siebold was the first to show, in the absence of what are termed the colleterial glands and the spermatheca,—organs of essential importance to the oviparous form.

In the terminal chambers of this “pseudovarium,” ovum-like bodies, thence called “pseudova,” are found. These bodies pass one by one into the pseudovarian tubes, and there gradually become developed into young, living *Aphides*. As Morren has well said, therefore, the young *Aphides* are produced by “the individualization of a previously organized tissue.”

The only organic operation with which this mode of development can be compared is the process of budding or gemmation, as it takes place in the vegetable kingdom, in the lower forms of animal life, and in the process of formation of the limbs and other organs of the higher animals. And the parallel is complete if such a plant as the bulbiferous Lily or the *Marchantia*, or such an animal as the *Hydra*, is made the term of comparison.

Thus agamogenesis in *Aphis* is a kind of internal budding or gemmation. If we inquire how this process differs from multiplication by true ova, or “gamogenesis,” we find that the young ovum in the ovarium is also, to all intents and purposes, a bud, indistinguishable from the germ in the pseudovarium of the agamogenetic *Aphis*. Histologically, there is no difference between the two; but there is an immense qualitative or physiological difference, which cannot be detected by the eye, but becomes at once obvious in the behaviour of the two germs after a certain period of their growth. Dating from this period, the pseudovum spontaneously passes into the form of an embryo, becoming larger and larger as it does so; but the ovum simply enlarges, accumulates nutritive matter, acquires its outer investments, and then falls into a state of apparent rest, from which it will never emerge, unless the influence of the spermatozoon have been brought to bear upon it.

That the vast physiological difference between the ovum and the pseudovum should reveal itself in the young state by no external sign, is no more wonderful than that primarily the tissue of the brain should be undistinguishable from that of the heart.

The phænomena which have been described were long supposed to be isolated; but numerous cases of a like kind, some even more remarkable, are now known.

Among the latter, the speaker cited the wonderful circumstances attending the production of the drones among bees, as described by Von Siebold; and he drew attention to the plant upon the table, *Cœlobogyne ilicifolia*, a female Euphorbiaceous shrub, the male flowers of which have never yet been seen, and which, nevertheless, for the last twenty years, has produced its annual crop of fertile seeds in Kew Gardens.

Not only can we find numerous cases of agamogenesis similar to that exhibited by *Aphis*, in the animal and vegetable worlds, but if

we look closely into the matter, agamogenesis is found to pass by insensible gradations into the commonest phænomena of life. All life, in fact, is accompanied by incessant growth and metamorphosis; and every animal and plant above the very lowest attains its adult form by the development of a succession of buds. When these buds remain connected together, we do not distinguish the process as anything remarkable; when, on the other hand, they become detached, and live independently, we have agamogenesis. Why some buds assume one form and some another, why some remain attached and some become detached, we know not. Such phænomena are for the present the ultimate facts of biological science; and, as we cannot understand the simplest among them, it would seem useless, as yet, to seek for an explanation of the more complex.

Nevertheless, an explanation of agamogenesis in the *Aphis* and in like cases has been offered. It has been supposed to depend upon "the retention unchanged of some part of the primitive germ-mass," this germ-mass being imagined to be the seat of a peculiar force, by virtue of which it gives rise to independent organisms.

There are, however, two objections to this hypothesis: in the first place, it is at direct variance with the results of observation; in the second, even if it were true, it does not help us to understand the phænomena. With regard to the former point, the hypothesis professes to be based upon only two direct observations, one upon *Aphis*, the other upon *Hydra*; and both these observations are erroneous, for in neither of these animals is any portion of the primitive germ-mass retained, as it is said to be, in that part which is the seat of agamogenesis.

But suppose the fact to be as the hypothesis requires; imagine that the terminal chamber of the pseudovarium is full of nothing but "unaltered germ-cells," how does this explain the phænomena? Structures having quite as great a claim to the title of "unaltered germ-cells" lie in the extremities of the acini of the secreting glands, in the sub-epidermal tissues and elsewhere; why do not they give rise to young? Cells, less changed than those of the pseudovarium of *Aphis*, and more directly derived from the primitive germ-mass, underlie the epidermis of one's hand; nevertheless, no one feels any alarm lest a nascent wart should turn out to be an heir.

On the whole, it would seem better, when one is ignorant, to say so, and not to retard the progress of sound inquiry by inventing hypotheses involving the assumption of structures which have no existence, and of "forces" which, their laws being undetermined, are merely verbal entities.

ZOOLOGICAL SOCIETY.

February 23, 1858.—Dr. Gray, F.R.S., V.P., in the Chair.

LIST OF SPECIES OF MAMMALIA SENT FROM THE ARU ISLANDS
BY MR. A. R. WALLACE TO THE BRITISH MUSEUM. BY
DR. J. E. GRAY, F.R.S., V.P.Z.S., PRES. ENT. SOC., ETC.

Mr. A. R. Wallace has lately sent to Mr. Samuel Stevens a col-